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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Piet Dewaele

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EXAMINER

FUJITA, KATRINA R

ART UNIT

PAPER NUMBER

2624

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.		Applicant(s)	
	10/776,736		DEWAELE, PIET	
	Examiner		Art Unit	
	Katrina Fujita		2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-9,13 and 15-21 is/are pending in the application.
- 4a) Of the above claim(s) 17-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-9, 13, 15 and 16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to Applicant's remarks received on June 28, 2007. Claims 1, 3-9, 13 and newly added 15-21 remain pending.

Election/Restrictions

2. Newly submitted claims 17-21 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claim 17 requires **fitting a circle segment to data** and using **a direction of a midpoint of the fitted circle** to determine the orientation and Claim 1 requires **direction and magnitude of normal vectors** associated with a curvature to determine the orientation. These patentable differences are not common to both claims and as such are inventive concepts.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 17-21 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Specification

3. The disclosure is objected to because of the following informalities:

On page 16, line 1, "fig. 6" should be "Fig. 6a". This appears to be a typographic error.

Appropriate correction is required.

Claim Suggestions

4. The previous claim suggestion has been withdrawn in light of Applicant's amendment.

Claim Objections - 37 CFR 1.75(a)

5. The following is a quotation of 37 CFR 1.75(a):

The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

6. Claim 5 is objected to under 37 CFR 1.75(a), as failing to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery.

Claim 5 recites "said curvature" at line 2. It is unclear whether this intended to be the same as or different from the "local curvature" in line 4 of claim 1. The following will be assumed for examination purposes: "~~said~~ a curvature".

Claim Rejections - 35 USC § 101

7. The previous 101 rejections have been withdrawn in light of Applicant's amendment.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1, 3, 8, 13, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chang et al. ("Radiology Image Orientation...", SPIE Conference on Image Display, which incorporates Glicksman et al. ("Architecture of a High Performance PACS...", Proceedings SPIE)) and Goris (US 5,970,182).

Regarding **claim 1**, Chang teaches a method to be employed by a computer of determining the orientation of an image ("radiology image orientation processor for workstation display" at section 1, line 3; "image orientation processor is meant to evolve into operational software" at section 2, paragraph 7, line 1) characterized in that the orientation is deduced from a digital representation of the image ("image orientation of digital X-ray images" at section 1, line 4).

Chang does not disclose that the orientation is determined from direction and magnitude of normal vectors associated with local curvature in a set of points.

Goris teaches a method of determining the orientation of an image comprising determining the orientation ("orientation and curvature information" at col. 7, line 45) from direction and magnitude of normal vectors ("where (n_x, n_y, n_z) is the normal vector of S_2 at N , and (n_x'', n_y'', n_z'') is the normal vector of S_1 " at M'' " at col. 7, line 43) associated with local curvature in a set of points (figure 9B).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the normal vector information of Goris to further define the orientation of Chang to "provide a reliable, operator independent method for the analysis and interpretation of organ images" (Goris at col. 4, line 46).

Regarding **claim 3**, Chang teaches a method wherein the digital representation is an edge representation ("digital chest image is first read in by the algorithm and then segmented into a binary image" at section 3A, paragraph 1, line 1).

Regarding **claim 8**, Chang teaches a method wherein direct exposure areas are excluded from the digital representation ("pixels in lungs as well as the area outside the body are assigned to be 0" at section 3A, paragraph 3, line 7).

Regarding **claim 9**, Chang teaches a method wherein an image is subjected to an orientation modifying geometric transformation ("If the side image is rotated by 90° or -90°, the algorithm will rotate the image" at page 292, paragraph 6, line 1) to yield a desired orientation of the image ("the algorithm assigns the image with notations such as HA, HP, FA or FP" at page 292, paragraph 6, line 2; "the notation used by the algorithm to indicate the patient's orientation" at section 2, paragraph 5, line 2).

Regarding **claim 13**, Glicksman teaches a computer readable carrier medium ("image processing card provides up to 65 MBytes of high speed buffer storage" at section 4, paragraph 4, line 3).

Regarding **claim 15**, Goris discloses a method wherein said orientation is deduced from an addition vector of said normal vectors (equation at col. 7, line 37).

Regarding **claim 16**, Chang discloses a method wherein said image is represented by an iso-intensity representation ("segmented into a binary image" at section 3A, paragraph 1, line 2).

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chang et al. and Goris as applied to claim 1 above, and further in view of Kawata et al. ("Characteristics Measurement for...", Nuclear Science Symposium, which incorporates Sander et al. by reference ("Inferring Surface Trace...", IEEE Transaction)).

The Chang et al. and Goris combination teaches the elements of claim 1 as shown in the 103 rejection above.

The Chang et al. and Goris combination does not teach computing first and second derivative vectors, quantizing the direction and magnitude of computed first and second derivative vectors, weighted voting of quantized first and second derivative directions into analyzing coordinate system orientations so as to determine a maximum vote and selecting the orientation having the maximal vote.

Sander teaches a method comprising:

computing first and second derivative vectors ("model normal" on page 839, denoted as " $N(p,q)$ "; " a ", " b ", and " c " in the sentence immediately following equation 1),

quantizing the direction and magnitude of computed first and second derivative vectors (equations 2 and 3 on page 839; " $||N(p,q)||$ " on page 840),

weighted voting of quantized first and second derivative directions ("principal curvatures can be computed at all k points" at section VI-D, paragraph 3, page 843) into analyzing coordinate system orientations ("conversion of the principal directions from the (P,Q) system into R^3 image coordinates" at section V-C, paragraph 3, page 841) so

as to determine a maximum vote ("determines the principal direction corresponding to the maximal principal curvature" at section VI-D, paragraph 6, page 844).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the orientation processor of the Chang et al. and Goris combination using the Darboux frame estimation taught by Kawata as described above, to "derive the image understanding of 3D object" (Kawata at section II, paragraph 1, line 13).

11. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chang et al., and Goris as applied to claim 1 above, and further in view of Kawata and Uppaluri (US 2003/0215119).

The Chang et al., and Goris combination teaches the elements of claim 1 as shown in the 103 rejection above. The Chang et al., and Goris combination also discloses that the image is a thoracic image ("chest images" Chang et al. at section 1, line 4).

The Chang et al. and Goris combination does not teach calculating curvature and basing a decision on the orientation of the image is based on the calculated curvature.

Kawata discloses a method in the same field of endeavor of medical image analysis ("system for three-dimensional image analysis of blood vessels" at section I, paragraph 2, line 1) wherein curvature is calculated ("surfaces representation using curvatures" at section I, paragraph 3, line 4) and a decision on the orientation of said

image is obtained based on the value of the calculated curvature ("following functions are implemented...extraction of the orientation of blood vessels" at section I, paragraph 2, line 5; "functions are based on...surfaces representation using curvatures" at section I, 1, paragraph 3, line 4).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the orientation processor of the Chang et al. and Goris combination using the curvature calculation taught by Kawata as described above, to "derive the image understanding of 3D object" (Kawata at section II, paragraph 1, line 13).

The Chang et al., Goris and Kawata combination does not teach curvature being determined of ribs or the ribcage.

Uppaluri discloses a method in the same field of endeavor of medical image analysis ("method and system for computer aided detection and diagnosis of dual energy ("DE") or multiple energy images" at paragraph 0001, line 3) wherein curvature is calculated ("region of interest statistics such as shape, size, density, curvature can be computed" at paragraph 0034, line 8; figure 6, numeral 230) which is used in a CAD algorithm ("candidate regions are then classified based on features extracted from the corresponding complete image set" at paragraph 0042, line 7; figure 11, numeral 340) on areas that include the ribs ("edges outside the ribs" at paragraph 0046, line 9).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the orientation processor of the Chang et al., Goris and Kawata

combination using the feature extraction taught by Uppaluri as described above, "to separate the edges inside the ribs from the edges outside the ribs, as edges inside the ribs are candidates for fractures" (Uppaluri at paragraph 0046, line 8) and subsequently provide for incorrect image orientation.

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chang et al. and Goris as applied to claim 1 above, and further in view of Kawata and Abdel-Mottaleb (US 5,572,565).

The Chang et al., and Goris combination teaches the elements of claim 1 as shown in the 103 rejection above.

The Chang et al. and Goris combination does not teach calculating curvature and basing a decision on the orientation of the image is based on the calculated curvature.

Kawata discloses a method in the same field of endeavor of medical image analysis ("system for three-dimensional image analysis of blood vessels" at section I, paragraph 2, line 1) wherein curvature is calculated ("surfaces representation using curvatures" at section I, paragraph 3, line 4) and a decision on the orientation of said image is obtained based on the value of the calculated curvature ("following functions are implemented...extraction of the orientation of blood vessels" at section I, paragraph 2, line 5; "functions are based on...surfaces representation using curvatures" at section I, 1, paragraph 3, line 4).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the orientation processor of the Chang et al. and Goris

combination using the curvature calculation taught by Kawata as described above, to "derive the image understanding of 3D object" (Kawata at section II, paragraph 1, line 13).

The Chang et al., Goris and Kawata combination does not teach a mammographic image and curvature is calculated for skin border edge segments of the image.

Abdel-Mottaleb discloses a method in the same field of endeavor of medical image analysis ("method of and system for segmenting digital mammograms" at col. 3, line 56) wherein curvature is calculated for skin border edge segments ("segment of the skinline of greatest curvature is selected" at col. 4, line 36) of a mammographic image ("digital mammograms" at col. 3, line 57) to detect the nipple in the image ("detected reference point corresponding to the nipple" at col. 7, line 45).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the orientation processor of the Chang et al., Goris and Kawata combination using the skinline extraction taught by Abdel-Mottaleb as described above, to "assure that equal amounts of tissue, between skinline and chest wall, are visualized in all views taken" (Abdel-Mottaleb at col. 2, line 58).

13. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Chang et al. and Goris as applied to claim 1 above, and further in view of Pietka ("Image Standardization in PACS", Handbook of Medical Imaging).

The Chang et al. and Goris combination teaches the elements of claim 1 as shown in the 103 rejection above.

The Chang et al. and Goris combination does not teach excluding collimation areas from the digital representation of the image.

Pietka discloses a method in the same field of endeavor of medical image enhancement ("image content adjustment to make images more readable...in preparation for medical diagnosis" at section 1, paragraph 2, line 6) wherein collimation areas are excluded from an image ("removal of collimator-caused background" at section 2, paragraph 2, line 3).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the orientation processor of the Chang et al. and Goris combination using the background removal taught by Pietka as described above, to provide "lossless data compression" (Pietka at section 2.1, paragraph 5, line 3).

Double Patenting

14. The previous double patenting rejections have been withdrawn in light of Applicant's amendment.

Response to Arguments

15. Applicant's arguments with respect to claims 1, 3-9, 13, 15 and 16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5,579,360, US 6,055,326, US 6,246,784, US 2003/0215120, and 2002/0164060 are each pertinent as teaching medical imaging enhancement systems.

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

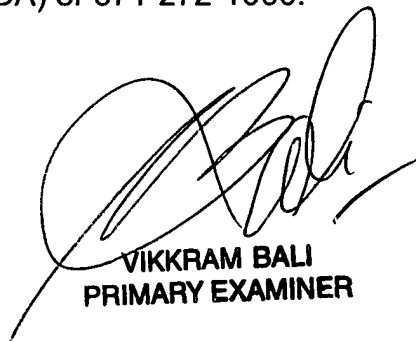
18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katrina Fujita whose telephone number is (571) 270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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